

DYNAMICS OF LAND REORGANIZATION IN AND AROUND URBAN AREAS OF INDIA, A CASE STUDY

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ABSTRACT

India is passing through a transitional phase where the urban centers have become the focal points of change. India, traditionally an agrarian country with three-quarter of its population living in rural areas, but in recent times phenomenal growth of population is observed in urban areas. As the population increases in urban areas, the demand of land for various urban activities also increases. This results in urban expansion and also has its bearing on urban land use.

The present study makes an attempt to measure the urban expansion, the changes in land use and to study the pace and direction of land reorganization in a growing urban center of India. Aligarh city is chosen as the study area which is one of the class I city situated in the western part of the most populous state of Uttar Pradesh (India). The study is based on remotely sensed data, which were processed in GIS environment. The result shows that significant expansion and land reorganization has taken place in Aligarh City mainly due increase in population and change in occupational structure, which raised the demand as well as value of land in and around the city. The city is expanding at a rapid rate swallowing the fertile agricultural land converting first in to vacant land to be used for construction afterwards.

KEYWORDS: Urban Centers, Demand of Land, Gis Environment

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INTRODUCTION

In today's world, over half of its population (approximately 54 per cent) lives in urban areas although there is still substantial variability in the levels of urbanization across countries. The continuing urbanization and overall growth of the world's population is projected to add 2.5 billion people to the urban population by 2050, with nearly 90 per cent of the increase concentrated in *Developing countries* among which India has the second largest urban population *India* (410 million) after China (UN Reports, 2014).

Today, although India remains by and large a rural agricultural country as the share of agricultural workers in the workforce is still 59 per cent of above 70 per cent people living in rural areas in 2011. But, the share of population living in urban areas has also increased and is little over 31 per cent in 2011. But these figures do not tell the whole story. There are evidences that urban growth is increasingly dispersed and urban sprawl promotes the spread of urban land use into the urban fringe (Fazal, S. 2008). Although, the growth rate is not increasing sharply, the absolute increase in urban population is very large, having increased up to 377.1 million in 2011.

Demographic growth stimulates structural change through multiplier effects and behavioural changes attract immigrants but the basis of urbanization is economic change and in particular the growth of large-scale

production and expansion of infrastructure. This trend has also fuelled by stressed agricultural activity in rural areas. Urban areas have become centers of all the activities, they are exploding in size, land use is changing quickly and constantly intensifying urban lands and large-scale land reorganization is taking place due to substantial increases in urban land value.

Several studies have highlighted the fact that the characteristic feature of Indian urban land use is its high degree of mixing, often to the extent that it is difficult to discern any pattern. In smaller cities and towns, the inter-mixing of land use is even more pronounced (Alam and Pokshishevsky, 1976). Fazal, in his studies found that small Indian cities tend towards linear development; he further stated that these urban areas are exploding in size resulting in rapid loss of fertile agricultural land and damaging the natural eco system (Fazal, S. 2000 & 2001). The urbanization process in India is generally regarded as haphazard and unplanned; there are little provision of open spaces, adequate infrastructure and services in urban expansions. While western cities have different land-use zones characterised by dominant uses. Indian cities tend to have different areal blocks with several activities in each (Surekha, 1988). This results in a division of a large city into smaller entities, which are mostly self-contained and loosely co-ordinated with each other. It is the Indian way to compromise with space by saving long distances. This is because of the general tendency of the people to live near their workplace to save on travel.

The present study aims to study the land use pattern of Aligarh City, its expansion and to find out the pace and direction of land reorganization in the city. The study also tries to highlight the main features of active urbanization process in the study area. The study area is the world famous seat of education (Aligarh Muslim University) and it also has industrial base, emerging as growing urban centre.

Aligarh city is located in the Gangetic plain area where agriculture is the principal economic activity due to the productive nature of the soils. It is the 7th largest populated city in Uttar Pradesh (Census 2011) and it has the status of class-1 city with 23% of the district population lives in Aligarh city. Although the urban growth rate is fluctuating in Aligarh city but the city population is gradually increasing. Studies suggest that rapid urbanization of Aligarh city has led to large scale land reorganizations and expansion of urban area (Fazal, S. 2013). The urban shadow effect is affecting the surrounding rural areas and the land value is increasing rapidly in and around Aligarh city (Banu & Fazal, 2014). The population is increasing by natural growth and migration in Aligarh city resulting in expansion of the city encroaching upon the lands from surrounding villages to accommodate these people.

DATA AND METHODOLOGY

The present study is based primarily on secondary data. Urban land use map was prepared using remotely sensed data (satellite imageries). These data along with extensive field checks and surveys provide accurate and up to date data. The advantages of these data are many, because urban areas are very dynamic and complex in nature and conventional data source were unable to cope with these data, as the information are dynamic. Satellite imagery has shown great utility in urban studies especially IRS – 1 D, which has the spatial resolution of 5.8 meters.

The present study uses remotely sensed data (satellite images) combined with extensive field checks and surveys. The study is based on IRS-1D with 5.8 metres resolution. The study is spread over almost thirty five year time span (1980 - 2014). The urban land use and reorganization mapping of Aligarh and its environs was done with the help of city guide map (prepared by Survey of India) on a 1:10,000 scale, updated in 1980, and IRS-1D geo-coded panchromatic satellite analogue imagery on a 1:12,500 scale, acquired in 2000 and 2014. The study was done in a GIS environment because the

use of GIS techniques coupled with remote sensing are essential elements for an integrated evaluation map. This work was carried out using ILWIS software.

DISCUSSIONS

Aligarh is an old city, which grew from an uplifted part (*Kol*), witnessed a long and cherished history including *Mughal's, Maratha's and Britisher's rule*. Aligarh city situated in the western part of Uttar Pradesh, between *Ganga* and *Yamuna* rivers at 27°53' north latitude and 78°35' east longitude (Figure 1). It is district headquarter and is famous as educational and industrial city. This city has gained importance because of its proximity to the national capital (New Delhi) and industrial cities of Uttar Pradesh (Kanpur and Ghaziabad). Systemic and planned development of Aligarh city would serve dual purpose – it would reduce the pressure on these cities, as it would provide employment opportunities in the city and it can even supply raw materials to these cities.

Urban Land Use of Aligarh City

The present study is spread over 15640 hectares of land, which is much beyond the actual urban limit of Aligarh city. This extended area covers expansion of the city in all directions. From the perusal of table 1 and figure 2, 3 and 4, it is evident that Aligarh city has witnessed large-scale changes in land use in and around the city. The statistics shows that urban area has increased from 2257 hectare in 1980 to 7523 hectare in 2014 (an increase of 230 per cent). Similarly built up area has increased from 1601.5 hectare to 4738 hectare (increase of 192 per cent). All these increases are at the expense of non – built up area, which shrunk from 13882 hectare to 10559 hectare (a decrease of about 25 per cent) during the study period. The city has witnessed major land use changes among classes such as residential area, an increase of 2640 hectare (261 per cent increase), commercial area, an increase of 191.5 hectare (328 per cent increase), vacant land, an increase of 2092 hectare (475 per cent increase) and industrial area an increase of 92 hectare (132 per cent increase). These changes were basically swallowed the crop land of the surrounding areas. Crop land has lost 5502 hectare (a decrease of 42 per cent) to the urban sprawl of Aligarh city. Among the other land use classes not much change has been observed. Area under villages have also increased as some of the villages have expanded in size to accommodate growing rural population. 351.5 hectare of land was occupied by the Aligarh Muslim University and 17.5 hectare by Aligarh fort. Both of these are located in the northern part of the study area and remained unchanged.

The salient characteristics, which emerges from table 1 and figure 2, 3 and 4 are as followed. Aligarh city has recorded a significant increase in built up area and this is mainly because of population growth and development in secondary and tertiary occupation structure. But this built up expansion was haphazard and without any planning. Even most of the recent residential colonies are developed without the provisions of basic amenities, resulting in severe congestion in road traffic, lack of open spaces and over flowing of drains. The urbanization process in Aligarh city is characterized by rapid growth in population followed by increase in built up area but not much change in utilities and services of the city.

During the study period Aligarh city has under gone substantial land reorganization, but only in some specific areas, which is the outcome of social, economic, religious and cultural factors. The newer part of the city has grown in the north and north-eastern part of railway line, which runs almost from the middle part of the city. Initially, the newer part consists of University and the civil lines but their pull factor of better civic amenities have attracted population, resulting in large scale land reorganization in this area. This part now dominated by residential class and commercial uses, this has

resulted in substantial increases in land value. The study reveals that with time, the older part of the city has become more and more congested while on the other hand the city has expanded outward in a haphazard manner and swallowed the agricultural land in the fringe area. The urban land use of Aligarh city is dominated by residential class, of which, most of it area is unplanned. The second largest area is occupied by vacant land, which is the outcome of rapid transformation of occupational structure and emergence of secondary and tertiary activities. The main reason for the increase of vacant land in the city was that initially when industrialisation took place, there was shortage of open land for construction. This demand has led to increase in the land value and owners of land started to get more money instantly, which they were not getting in agricultural sector. In anticipation more and more people started to offer their land for construction resulting in phenomenal reorganization of land from agricultural uses to vacant land. Later this demand due to stagnation and saturation subsided, resulting in increase of vacant land, which is neither used for urban development nor is it useful for agricultural sector. The city has 156 hectares of land under industries, which is quite high by traditional Indian standard. Commercial area in the city occupies 248 hectares of land. There are two distinct commercial zones in the city. One is located in the older part of the city and second is of recent origin to cater the demand of newer part of the city. The newer commercial area is in the north eastern part of the city and it is characterized by showrooms and offices of big organizations. However both of these are along the major roads. Interestingly area under city's recreational and utilities, services covers almost negligible area, which indicates that, not much attention is paid to these facilities despite significant increase in population.

The land use pattern of Aligarh City is different from the general land use pattern of western cities. The existence of a mono-economic system and an advanced transportation technology of the western cities had led to a maximum specialisation of land use which has most frequently taken the form of concentric circles of relatively homogeneous economic usage. From the perusal of Figure 2 and 3, no such clear zonation characterises the land use pattern of Aligarh city. It is hard to generalise about the patterns of residence. The rapid growth of population of the city associated with the socio-economic changes, which are creating an emergent middle class, have caused a proliferation of squatter settlements in the interstices and fringes of the city. The dominance of various social and religious groups in distribution of various residential pockets is also quite a prominent feature. At present Aligarh city shows little conformity with the western cities where direct relationship is observed between social class and distance from the centre of the city with working class living closest to the city core and upper class in the city fringe. The pattern of residence in Aligarh city includes a mixture of poor and rich elements of the city in both the core and outer areas within their social and religious residential area. It represents some transitory phase of development between the patterns of pre-industrialism and post-industrialism. There were two distinct commercial zones in Aligarh city, one in older part and another in newer part. These zones have peculiar radial dimension along the main roads. Some other commercial areas are scattered, but located along the roads and their concentration declines with distance. These commercial areas are crowded and a picture of congestion and traffic jams. The industrial land use of the city resembles the western cities in some way. The larger industrial units are located in the fringe area but the main difference from western cities is that it is not confined to specialised estates but are scattered. The other land use classes especially like vacant land is governed by local factors. The same trend is not necessarily found in other cities of India. Another significant feature of Aligarh city is lack of public space like parks, play ground etc. and even public utilities and services have negligible occupance in the city. It indicates lack of planning and co-ordination among various government authorities for developing these facilities, which are under severe stress from rapidly increasing population. The over all spatial organization in Aligarh city represents indigenous characteristics, which stem from

indigenous living conditions and the indigenous ways of adaptation with them. This pattern confirms the Gerald Breese's opinion for Indian urbanization where he termed it as subsistence urbanization (Breese, G., 1969).

Land Reorganization in Aligarh City

Land reorganization is the process of identifying differences in the state of any phenomenon by observing it at different time periods. Land is in a continuous state of transformation as a result of various natural and man-made processes. The study of land reorganization, therefore, requires a comprehensive understanding and monitoring of all the factors that cause the land reorganization. During the study period, Aligarh city has not only expanded from its original size but there was significant interchange of land among various land use classes. Table 2, 3 and figure 5, which are prepared applying G.I.S. technique, shows the changes in various urban land use class of the city. These changes are because of the development of city resulting in increased demand of land for residential, commercial, industrial etc. purposes. This demand of land along with site attraction, functional convenience, functional magnetism and the land value of that particular area ultimately influence the pace and direction of urban land use change.

The residential area has increased by 2640 hectare, capturing land mainly from agriculture (2144 hectares), vacant land (415 hectares), tree plantation (179 hectares) and villages (65 hectares). Residential area also lost area for commercial development (109 hectares). Commercial area has increased from 56 hectares to 248 hectares gaining land from residential area (109 hectares) and vacant land (19 hectares) in the city. Industrial area has increased from 64 hectares to 156 hectares capturing mainly the agricultural lands (28 hectares) because this development is mostly away from the city centre. Plantation area has increased marginally as significant interchange among different land use class was observed. Tree plantation lost 175 hectare of its area for residential development, another 79 hectares converted as vacant land, 32 hectare for industrial purposes, while on the other hand, it received land from agricultural (311 hectare) and vacant land (85 hectares). The city has recorded a massive increase from 441 hectares in 1980 to 2533 hectares in 2014 under the land use class vacant land. It captured land from agriculture class (2798 hectares) while lost area mainly for residential (405 hectares) development. During the study period all the city expansion is mainly on crop lands, which decreased from 13209 hectares to 7707 hectares resulting in heavy losses of fertile crop lands.

This land reorganization in Aligarh city is clearly the outcome of the operation in the urban land market, which has many dimensions but the most important and relevant in present study was land value. Demand and supply factors in land market interact in ways that determines land value which in turn, have important bearing on the way in which land is used or allocated among alternative users. Since land as it is used in cities is a highly differentiated product, if only because of differences in the accessibility of sites of available parcels, what is important is the configuration of land values.

Driving Forces of Urbanization Process in Aligarh City

Several drivers of urbanization are responsible for the growth and expansion of Aligarh city. The most significant driving force is increase in population. The increase of population in the city is attributed to both natural as well as migration from rural hinterland. The steady growth of population in the last three decades has resulted in expansion and intensification of land use. This expansion was much faster and the provision of urban services, amenities and even housing facilities could not keep pace with it and lagged behind the urban expansion.

The economic transformations have also fuelled the increase in urban population through migration to city due to developments in secondary and tertiary activities. The market forces are also accelerating the urban process in the study

area. It is influencing the urbanization in three distinctive ways. First, the consumption of commodities produced in fringe areas of Aligarh city. The high demand and consumption pattern is driving the expansion of the city through development and extension of several economic, commercial and other marketing establishments. This is characterized by informal sector proliferation. Second, through transformations of land for development in the city, this has intensified recently leading to commodification of land and informalization of the land acquisition processes. This is reflected in rapid increase in land rents. Third, The consequence of informalization and comodification has been the conversion of environmentally sensitive land to urban uses with social consequences mainly at the fringes of the city. This phenomenon leads to rapid expansion engulfing peripheral rural landscapes impacting the livelihood of rural population. Significantly, the city development and expansion is mainly regulated by private interests and different stake holders make investments only in specific areas of interest to bring urban expansions only in desired locations.

Urban Planning and Development

Urban planning is crucial for the development and expansion of the city. Urban planning in Aligarh city is one of the many factors responsible for the contrasting processes of urban expansion in the study area. Although spatial planning exists (in the form of city master plans), but experience shows very limited account of such planning and planning outputs on the ground. Implementation of spatial plans has largely failed due to institutional weaknesses, financial constraints, political interference and lack of appreciation of planning by society. What is under practice is piece-meal planning that is not necessarily guided by a comprehensive development plan for Aligarh city. The uncontrolled developments, inadequate services and infrastructure are partly explained by failure to implement the development plan for Aligarh city although some environmental concerns such as protection of agricultural lands are rooted in the plans. But the recent intensification of the urban land market especially in the peri-urban areas of Aligarh city has far reaching implications on social changes, environment and sustainable development of the city.

CONCLUSIONS

Some of the main findings of the present study are as follows:

- Built up area has expanded in all direction but it was more pronounced in north direction than in southern part of the city, where congested older part of the city has blocked the growth.
- The study area has recorded a significant increase in residential area to accommodate the rapidly growing population of the city, but this increase was more pronounced in case of unplanned residential area rather than in the planned residential area.
- There was massive increase in residential area but not much change has occurred among utilities, services and recreational facilities etc., which indicates haphazard city expansion.
- Agricultural land is being converted into non-agricultural land (built up and non-built up urban expansion) because of rapid expansion in Aligarh City.
- Ribbon like urban development along main roads is a noticeable phenomenon in the city. The urban expansion is taking place in a peculiar way. In the first phase agricultural land is converted into vacant land along the main roads. In second phase this land is used for constructing buildings. During the third phase the intervening peripheral land between the roads are used for urban development. This process of urban development can be

termed as frontal expansion, which is characterized by piecemeal accretion of the built up areas.

- Commercial areas have increased in the city, but their development is only along the main roads. These areas are in very high land value zone, and that is why commercial areas have pushed residential area away to the outer part of the city.
- Vacant land in and around Aligarh City has increased substantially. The main reason for its increase is the shortage of open land for construction. This demand has led to increase in the land value and owners of land started to get more money instantly, which they were not getting in agricultural sector. So in anticipation more and more people started to offer their land for construction resulting in phenomenal reorganization of land from agricultural uses to vacant land.
- The characteristic feature of urban land use in Aligarh city (like most of the Indian cities) is its high mix and it is very difficult to make out any pattern out of it. Specialization of activities in a specific area, so common in the western cities, does not exist here. The spatial organization in the Indian towns and cities is distinguished by the diversified occupance of space. The Indian towns and cities have evolved this peculiar way of adaptation with space, is not based on economic interdependence and segregation.

Lastly, we can say that urbanization pattern of Aligarh city is characterized by poverty, shortage of housing and civic amenities and diversified occupance of space, which resembles like a large village. Here in lies the major departure of the urbanization pattern in Indian cities from the western cities. Urbanization may be an indicator of development in western countries but in India, especially in growing small towns it is difficult to accept. Here, the population is increasing rapidly, the demand for land also increases. Development is occurring well ahead of planning resulting in settlements that have inadequate services and infrastructure. The fast paced expansions have also in turn made it difficult to implement the spatial plans that would otherwise guide the expansion of the city. The nature of Aligarh city's expansion raises concern on the sustainability of urban development due to the socio-economic and environmental problems created by its nature. Unplanned settlements with characteristics of poor and inadequate infrastructure, social services and haphazard development are evident within and at the fringes of Aligarh city and have led to persistence poverty and suffering to a sizeable proportion of Aligarh city's population.

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APPENDICES

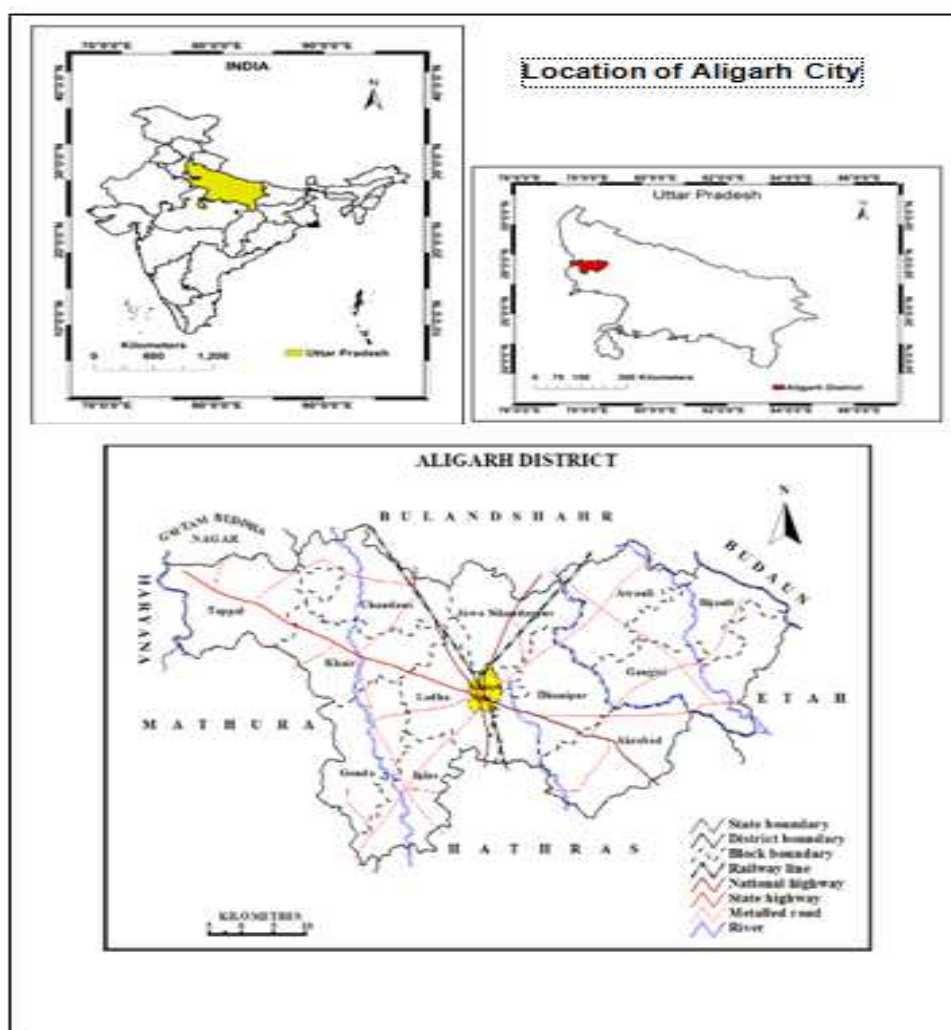


Figure 1

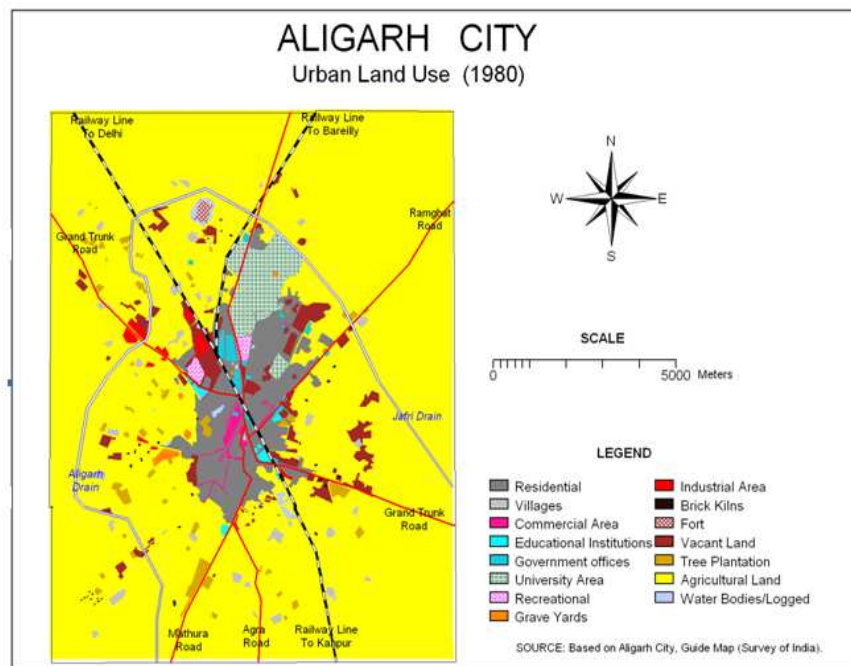


Figure 2

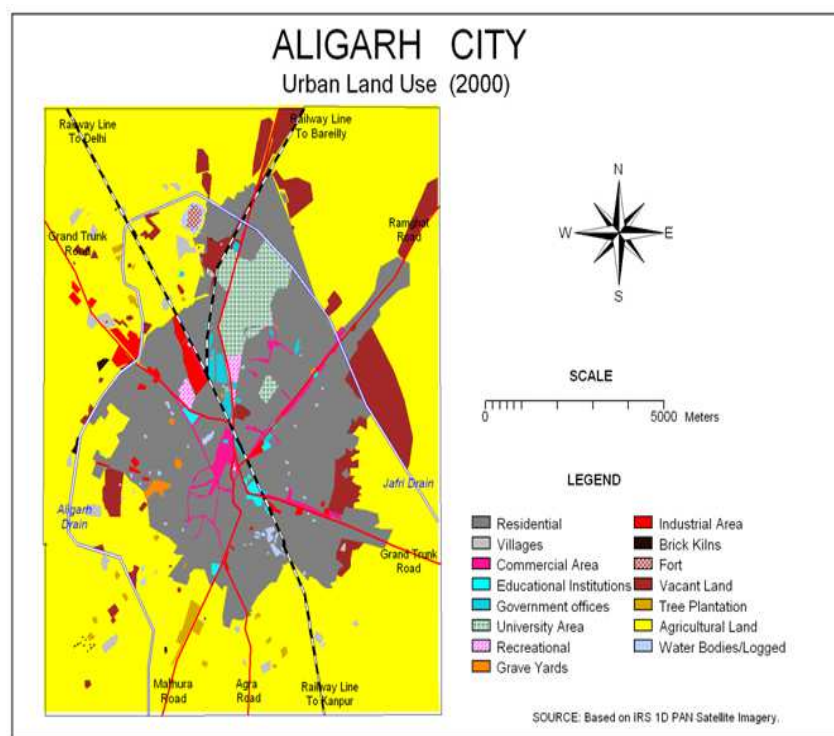


Figure 3

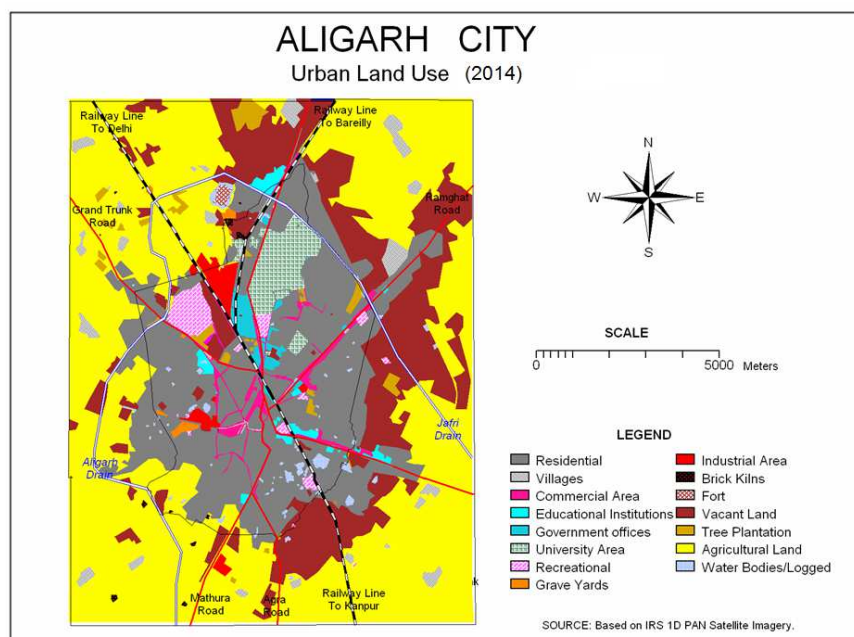


Figure 4

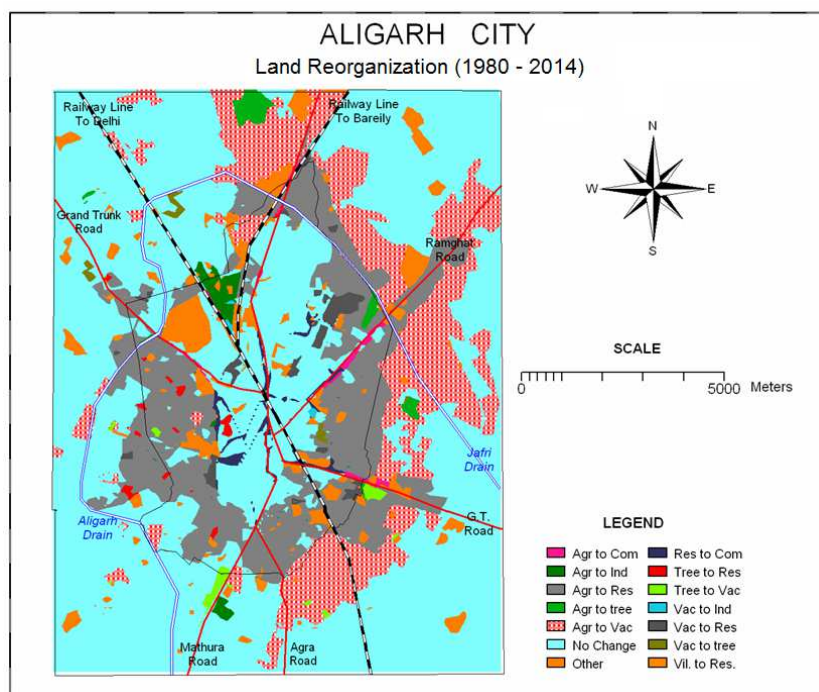


Figure 5

Table 1: Aligarh City: Area under Different Land Uses (1980, 2000 and 2014)

Land Use / Year	Area (1980)	Area (2000)	Area (2014)	Change in Area	%age Change
Residential	994.5 (6.35)	2736 (17.49)	3634.5 (23.2)	2640	265.6
Villages	111.5 (0.71)	135.5 (0.86)	293 (1.87)	181.5	163.9

Table 1: Contd.,					
Commercial	56.5 (0.36)	169 (1.08)	248 (1.58)	191.5	338.9
Educational Institutions	28.5 (0.18)	36.5 (0.23)	113.5 (0.72)	85	303
Government Offices	64 (0.41)	75.5 (0.48)	133 (0.85)	69	107.8
University Area	351.5 (2.24)	351.5 (2.24)	351.5 (2.24)	--	--
Aligarh Fort	17.5 (0.11)	17.5 (0.11)	17.5 (0.11)	--	--
Industrial	64 (0.41)	107.5 (0.68)	156 (0.99)	92	143.7
Recreational	42.5 (0.26)	49.5 (0.31)	101.5 (0.64)	59	140.4
Grave Yards	27.5 (0.17)	36.5 (0.23)	32.5 (0.20)	5	18.5
Vacant Land	441.5 (2.81)	1374.5 (8.78)	2533.5 (16.2)	2092	473.8
Tree Plantation	172 (1.09)	67.5 (0.43)	191.5 (1.22)	19.5	11
Agricultural Land	13209 (84.40)	10407 (64.62)	7707 (49.2)	-5502	-42.3
Brick Kilns	14.5 (0.09)	15.5 (0.09)	17.5 (0.10)	3	21.4
Water bodies/logged	45 (0.28)	60.5 (0.38)	109.5 (0.69)	64.5	142.2
Total	15640	15640	15640	--	--
Total Built up Area	1601.5	3525.5	4738	3136.5	192.2
Total Non Built up Area	13882	11925	10559	-3264	-24.6
Total Urban Area	2257	5019.5	7523	5266	230.4

Note: Area in Hectares

Table 2: Aligarh City: Land Reorganization Among Important Land Use Classes

Area in 1980(Hectares)	Land Reorganization	Area in 2010 (Hectares)
Residential (994.5)	Residential Area to Commercial Area (109.5) Residential Area to Others (30.5)	Residential (3634.5)
Villages (111)	Villages to Residential Area (65)	Villages (293)
Vacant land (442)	Vacant Land to Residential Area (410) Vacant Land to Villages (88) Vacant Land to Tree plantation (85) Vacant Land to Agricultural land (29.5) Vacant Land to Others (148)	Vacant land (2538.5)

Table 2: Contd.,		
Tree Plantation (172)	Tree Plantation to Residential Area (179) Tree Plantation to Villages (43) Tree Plantation to Industrial Area (32.5) Tree Plantation to Vacant Land (79.5) Tree Plantation to Others (43)	Tree Plantation (191.5)
Agricultural land(13209)	Agricultural Land to Residential Area (2151.5) Agricultural Land to Villages (115) Agricultural Land to Commercial Area (62) Agricultural Land to Industrial Area (35) Agricultural Land to Vacant Land (2798) Agricultural Land to Tree Plantation (311) Agricultural Land to Others (57.5)	Agricultural Land (7707)
Others (Recreational, Grave Yards and Brick Kilns) (84)	Others to Residential (9) Others to Water bodies (6)	Others (151.5)

Table 3: Aligarh City: Causes and Consequences of Land Reorganization

Nature and Location of Land Reorganization	Area Reorganized (1980-2014)	Main Activities	Impacts
Vacant land to Residential Tree plantation Villages Industrial Area Agricultural area Others	 410 hectares 85 hectares 88 hectares 24.5 hectares 29.5 hectares 148 hectares	The conversion to industrial area and commercial area from the vacant land has taken place along the major transportation corridors. To fulfil the heavy demands of city dwellers for agricultural products like food grains, vegetables, fruits etc, the farmers in peripheral areas have now switched towards the higher value crops.	Ribbon like development has been observed and commercial areas in the core and transport corridors have pushed residential area away to the outer part of the city. Cropping pattern has also changed in the peripheral areas of the city.
Tree plantation to Residential Villages Industrial area Vacant land Others	179 hectares 43 hectares 32.5 hectares 79.5 hectares 43 hectares	Vacant land has increased due to shortage of open land for construction.	Pressure of increasing population led to the demand of land for residential and other uses escalating land value. As a result farmers are offering their land for urban use and abandoning agricultural activities to earn quick income.
Agricultural land to Residential Villages Commercial Industrial Vacant land Tree plantation Others	2151 hectares 115 hectares 62 hectares 35 hectares 2798 hectares 311 hectares 57.5 hectares	A steady transformation of land from agriculture to built up and other uses which are primarily in response to the demand of the city and this transformation is mainly found in the city peripheral region.	The loss of fertile agricultural land is an important consequence of uncontrolled growth of cities and also negative consequences on food security, water supply as well as the health of the people both in the cities and in the suburban areas.